Intergovernmental Panel on Climate Change Report: Findings and Implications for California

OCTOBER 28TH, 2021

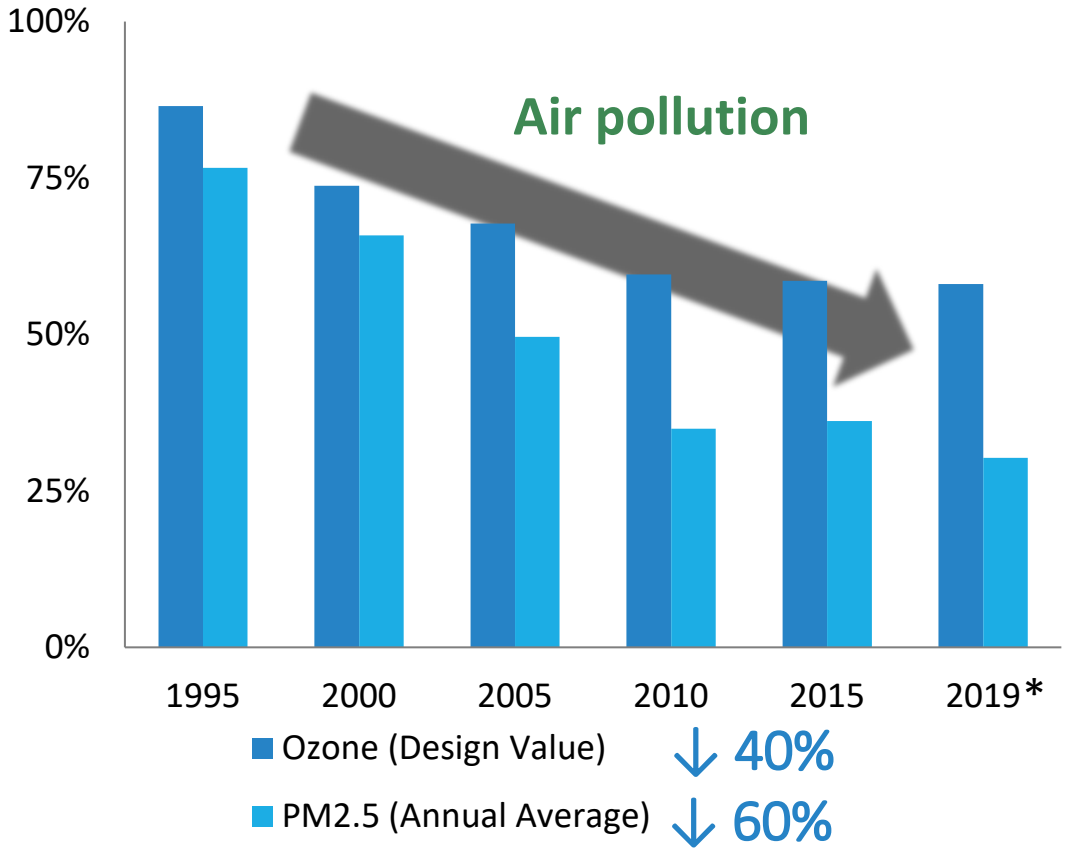
Success through Science

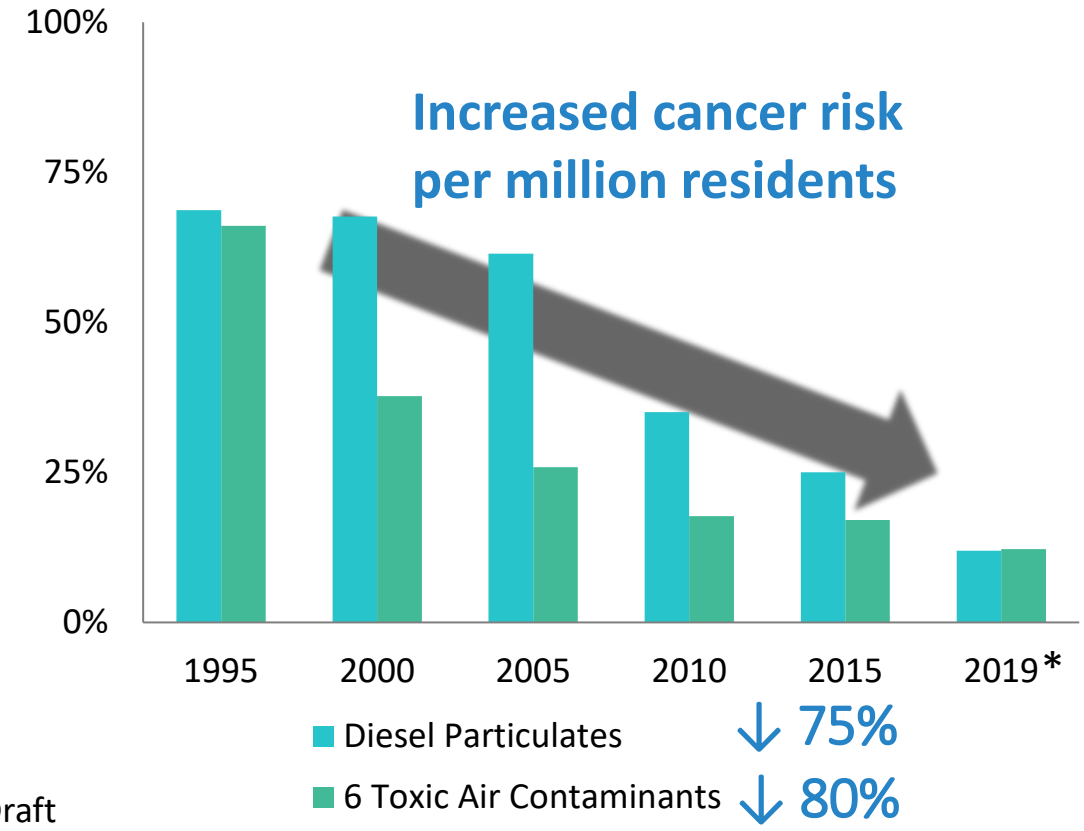
- Leader in air quality and climate change science for over 50 years
- Ensures rulemakings are scientifically sound and protect public health
- Engages state, national and international scientific experts
- Conducts key research on air quality and climate challenges and solutions – using the best available science and technology

CALIFORNIA
AIR RESOURCES BOARD

Significant Progress on Air Quality and Health, but More is Needed

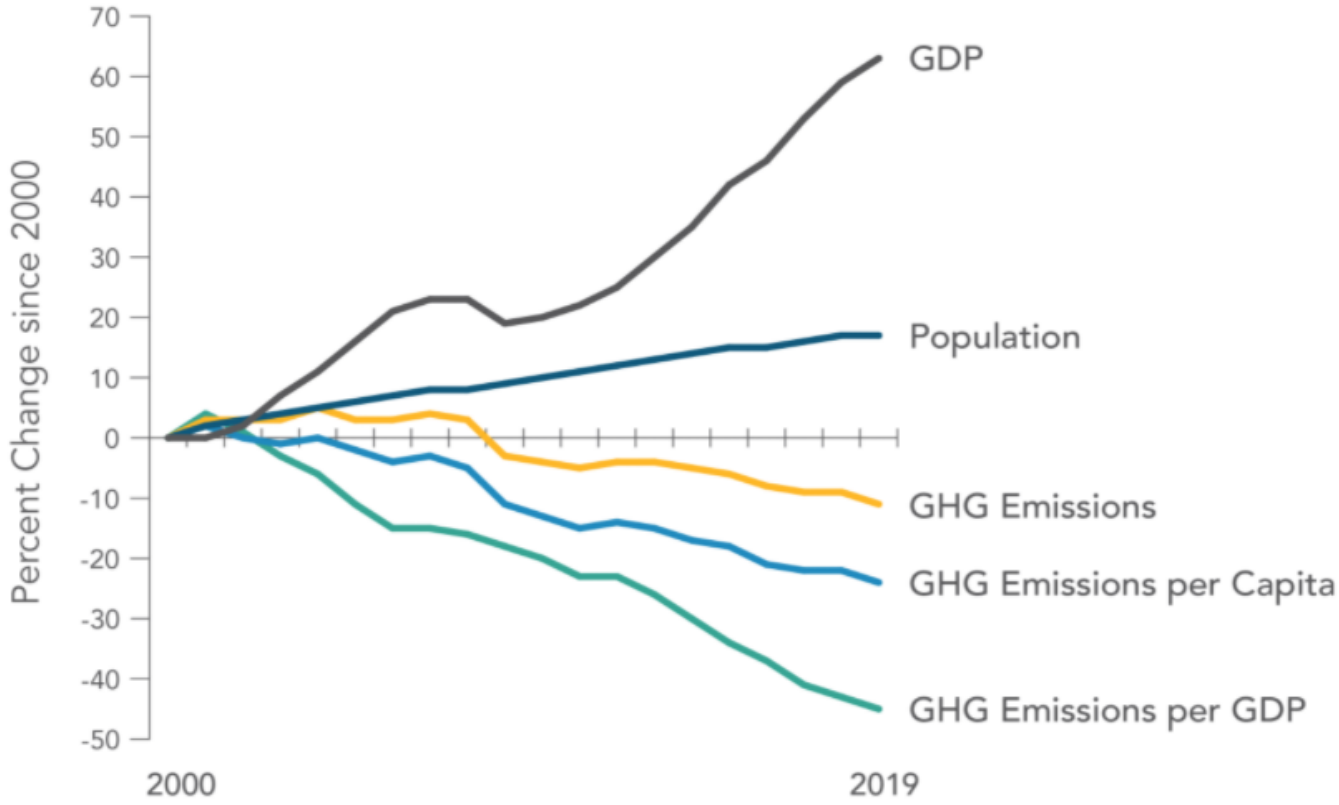
Changes relative to 1990-1995





* Draft

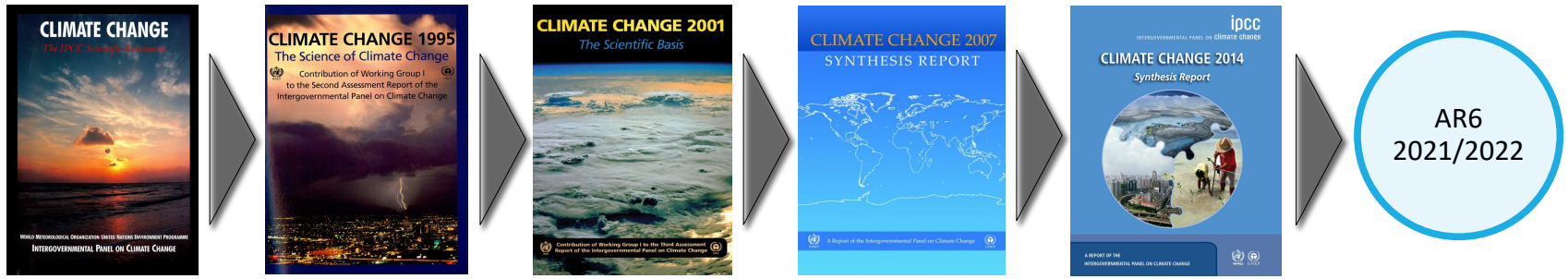
Measure of Success: Climate



- California's GHG emission returned to 1990 level 4 years earlier than AB 32's 2020 target
- Per capita and per GDP emissions continue to decline

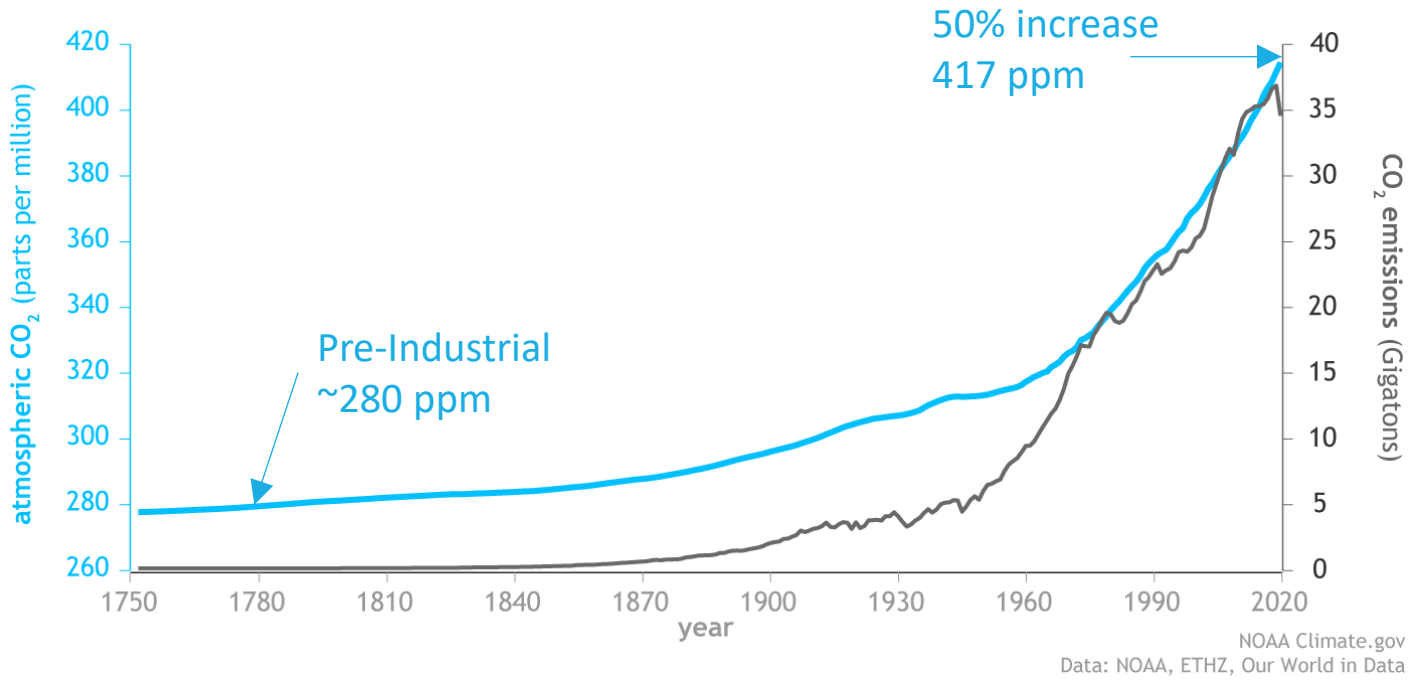
Intergovernmental Panel on Climate Change

- IPCC is a United Nations body that consists of 195 member countries with thousands of volunteering scientists that assesses the scientific basis of:
  - climate change
  - impacts of climate change and future risks
  - options for adaptation and mitigation of those risks
- IPCC reports undergo an intensive process of peer review by international experts
- Prior IPCC Assessment Reports played key roles in the UNFCCC and the Paris Agreement
  - limiting global warming below 2, preferably to 1.5 °C, compared to pre-industrial levels



Introduction of GHGs Into the Atmosphere

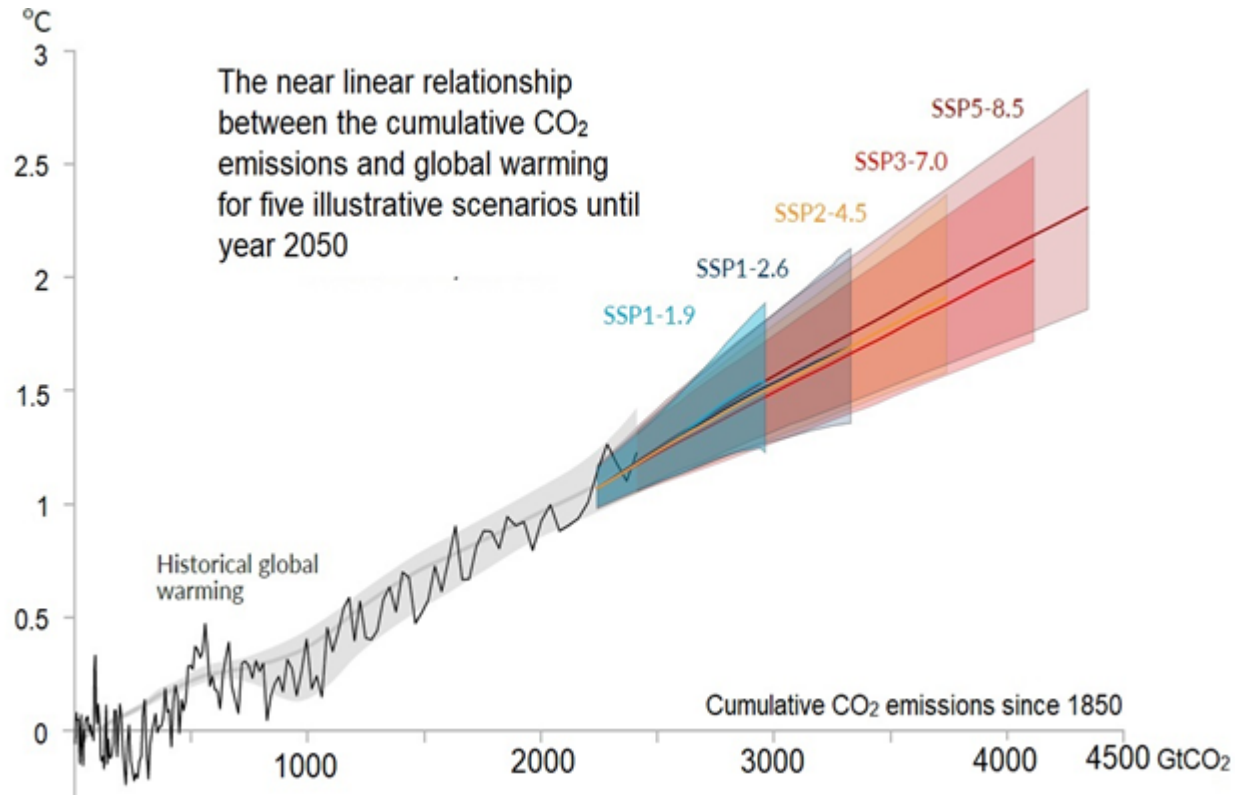
- Industrial revolution has increased the GHG loading on our atmosphere
- Atmospheric CO_2 is now 50% higher than pre-industrial levels and currently increases by at least 2 ppm every year
- CO_2 emitted today can remain in the atmosphere for hundreds of thousands of years and will continue contributing to global warming
- Must address ongoing and already emitted GHG emissions



Source: NOAA, 2021

IPCC Sixth Assessment Report: Increasing Temperatures

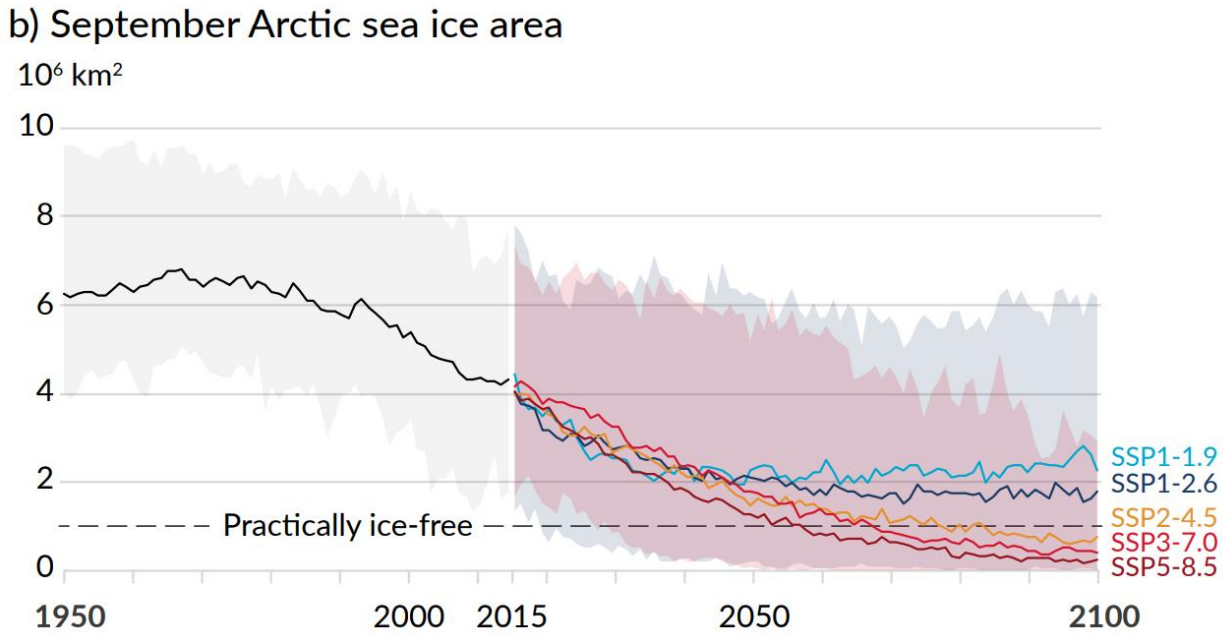
- IPCC Working Group I report: "Climate Change 2021: The Physical Science Basis"
- Reaffirms the near-linear relationship between anthropogenic CO_2 emissions and global warming
- Temperatures will reach 1.5°C above pre-industrial levels by 2040 under all GHG emissions scenarios
- Stabilizing human-induced global temperature increase requires global net zero CO_2 emissions



Source: IPCC, 2021 – Figure SPM.10

IPCC Sixth Assessment Report: Melting Arctic Ice

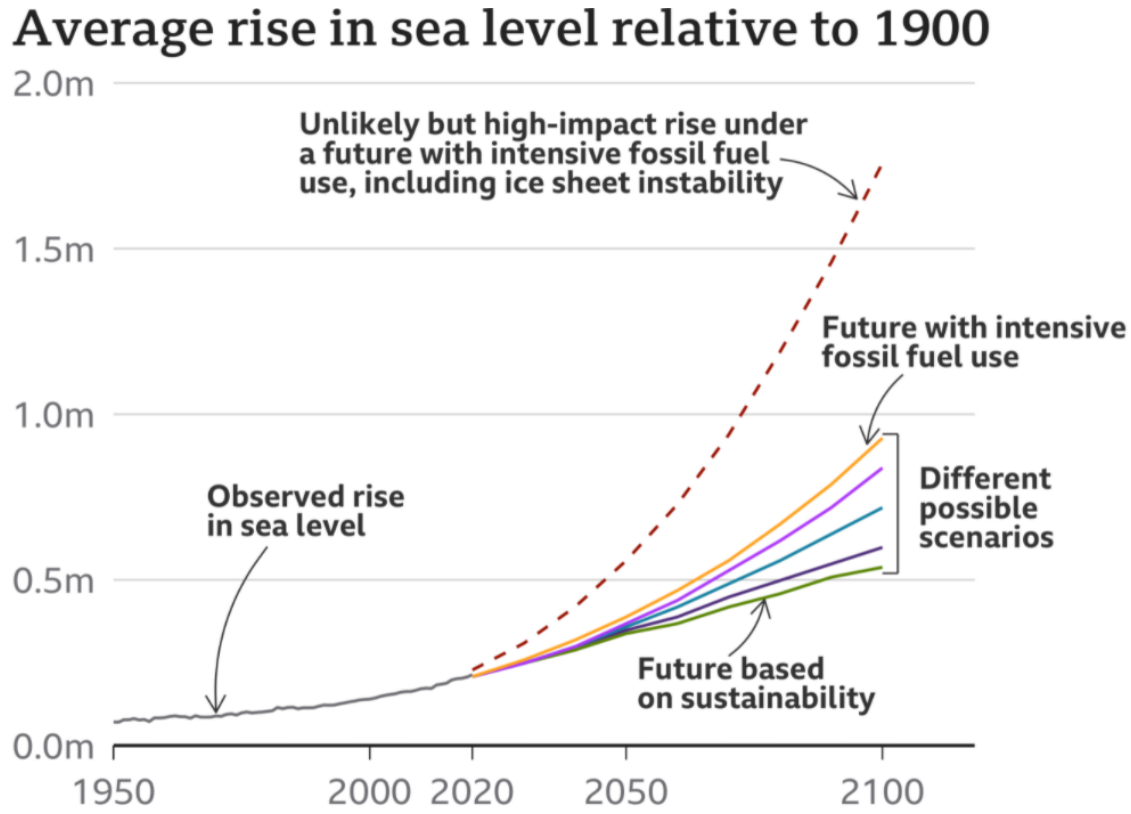
- Human influence is very likely the main driver of the retreat of Arctic glaciers since the 1990s
- Annual average Artic sea ice area in the last decade reached its lowest level ever recorded
- The Arctic:
  - is likely to be ice-free in at least once before 2050 in all scenarios
  - will remain ice-free near 2050 under mid- and high GHG emissions scenarios



Source: IPCC, 2021 – Figure SPM.8.b

IPCC Sixth Assessment Report: Rising Sea-level

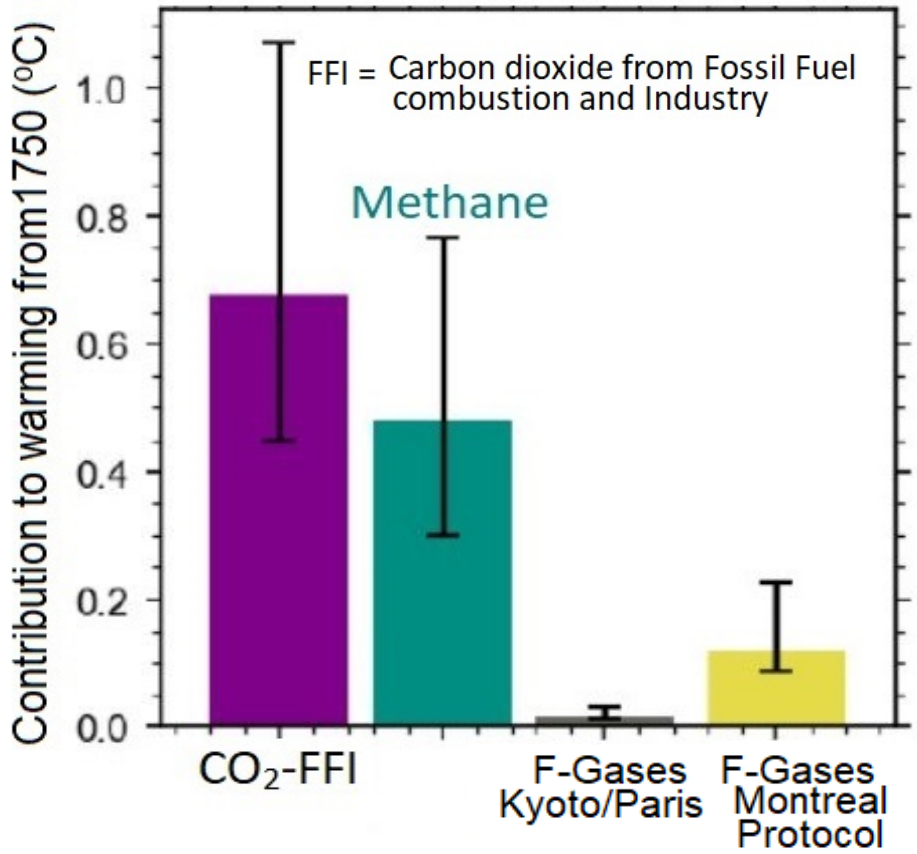
- Recent rate of sea-level rise has nearly tripled compared with 1901-1971
- Under all GHG emission scenarios the average rise in sea-level will be double that of 2020 within the century.
- Expect average rise in sea-level to double within the century
- Extreme sea-level events are projected to occur at least annually at more than half of tidal gauge locations by 2100
- A rise of ~2 meters by the end of this century cannot be ruled out



Source: IPCC, 2021—Figure SPM.8.d

Reducing CO_2 and Short-lived Climate Pollutants is Critical

- Cumulative impact from all SLCPs (also referred to as short-lived climate forcers) on global warming is close to that of CO_2
  - Need to reduce both CO_2 and SLCPs: address near-term warming and allow long-term climate stabilization
- Contributions from methane and halogenated gases are expected to increase
- Delay would "lock-in" more emissions from non-CO_2 GHGs — fugitive methane, refrigeration, air conditioning and heat



Adapted from Minx et al. 2021, ESSD

Evidence of Global Warming is Mounting

- Changes we are seeing are unprecedented in recent history and will affect every region in the globe
- Enormous human and economic costs that far outweigh the costs of action
- All evidence points towards climate-induced migration becoming one of the major policy challenges of this century.

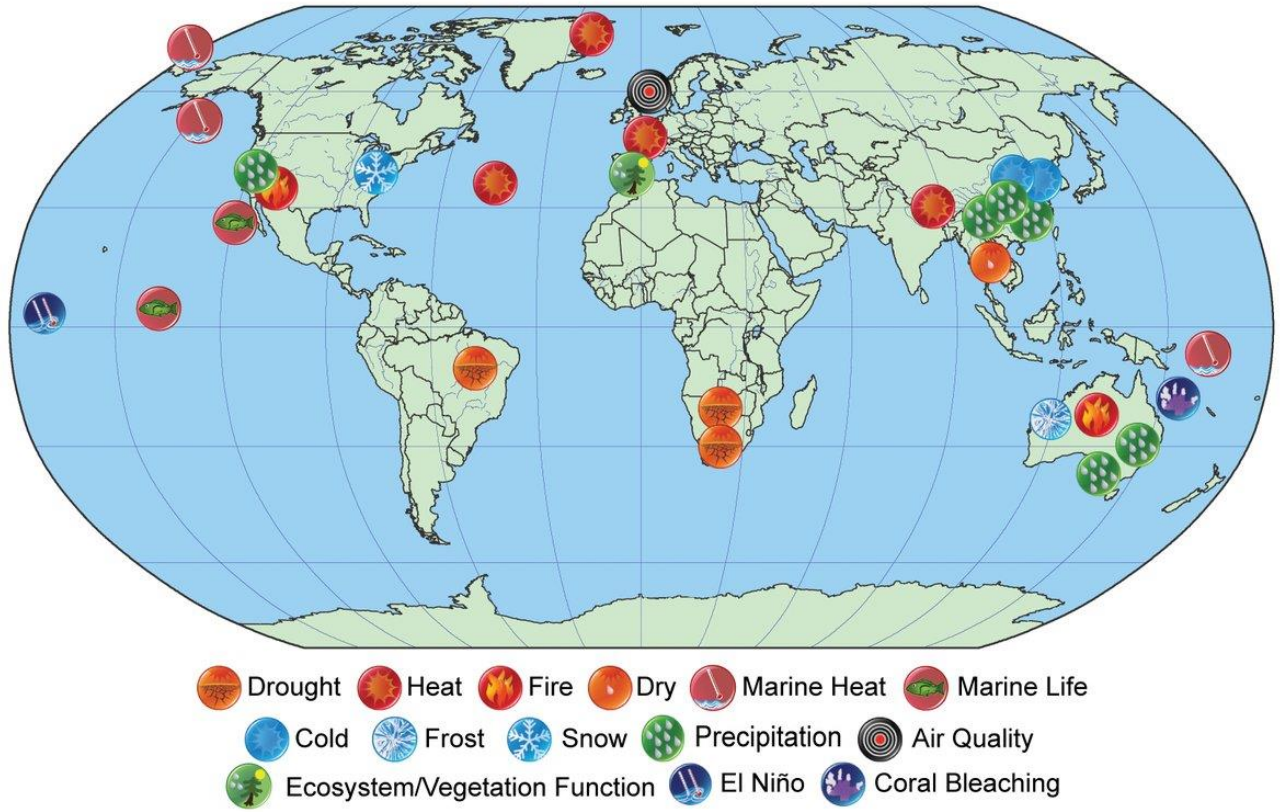
Changes in

- Snow and ice
- River flooding
- Storms
- Droughts
- Fires

Affects

- Infrastructure
- Transport
- Energy Production
- Tourism

Location and Types of Extreme Events



Immediate Call to Action

IPCC AR6 WG1 suggests that limiting global warming to 1.5°C by the end of the century is still within reach, but requires transformational change:

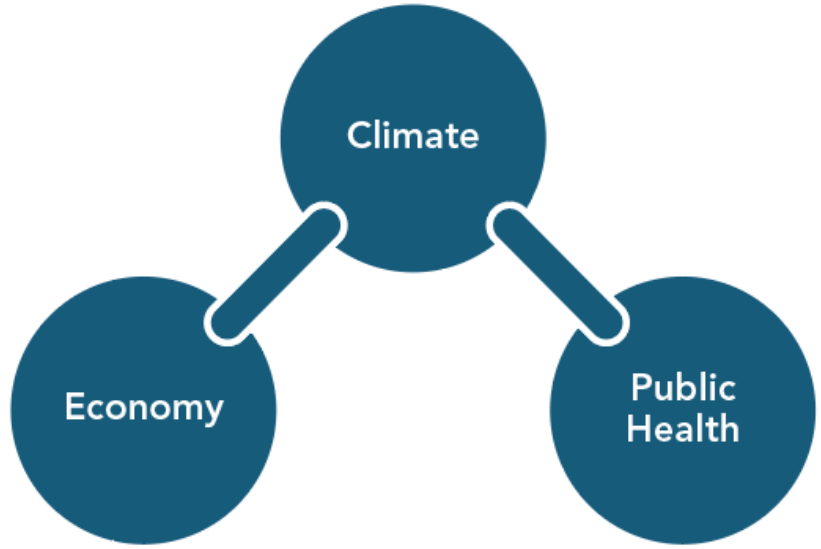
- Cut global GHG emissions in half by 2030
- Reach global net zero CO_2 emissions by the middle of this century
- Not mutually exclusive

Implications for California Climate Policy

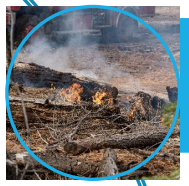
Imperative to Act Now

Climate change is happening and impacting public health and the economy:

- Disproportionate burdens experienced by frontline communities
- Increased susceptibility to respiratory illnesses such as COVID-19 due to poor air quality
- Record-setting wildfires that directly endanger human health and property
- Extended droughts that damage California's billion $ agricultural industry



Climate Change Impacts on Health Equity



Extreme weather, heat, drought, wildfires

Vector borne disease, increased allergens

Poor living conditions, social inequities, reduced food supply

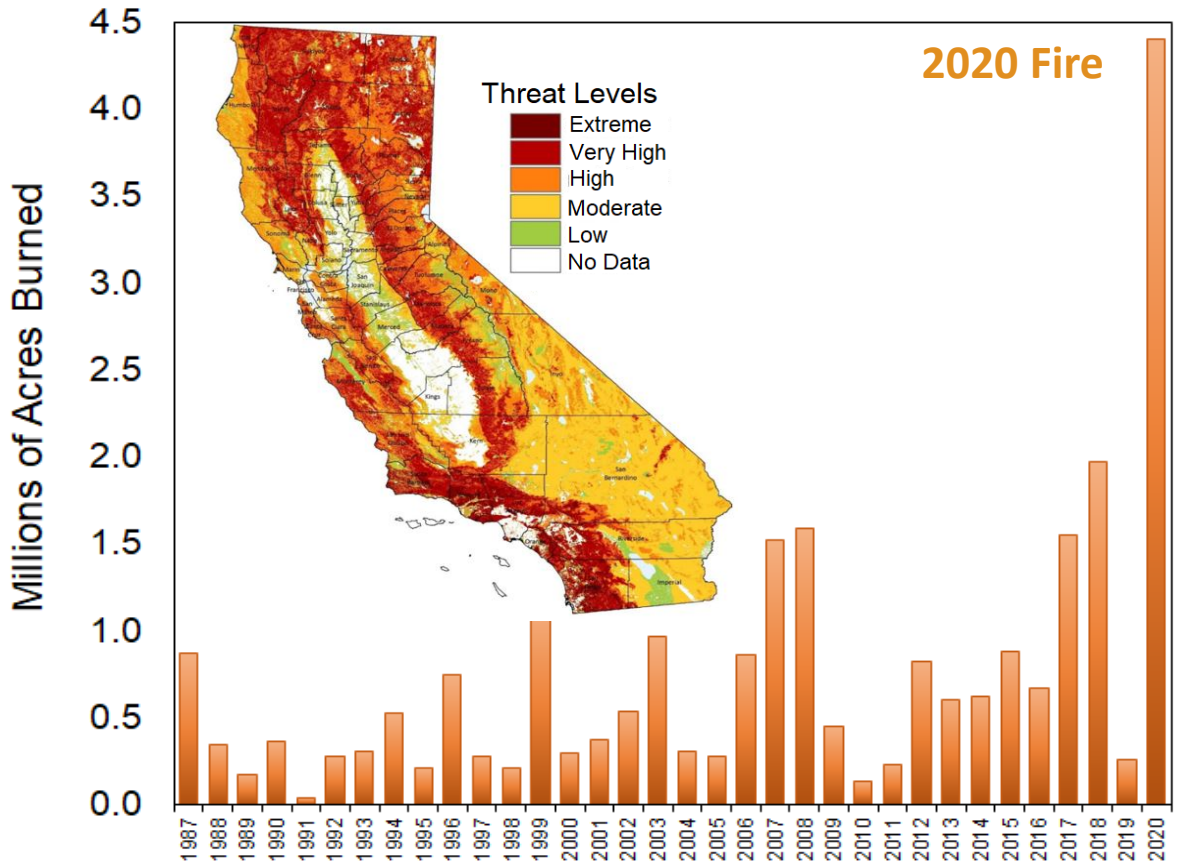
Air and water pollution, degraded environment

California's Wildfires

- More frequent
- Larger and more aggressive
- Longer fire seasons

- 2020 experienced the most intense wildfire season in recent history
  - 500 wildfires
  - 4.2 million acres burned
  - 10,000 structures destroyed
  - $12 billion in damages

- As of October 2021, 2.5 million acres burned



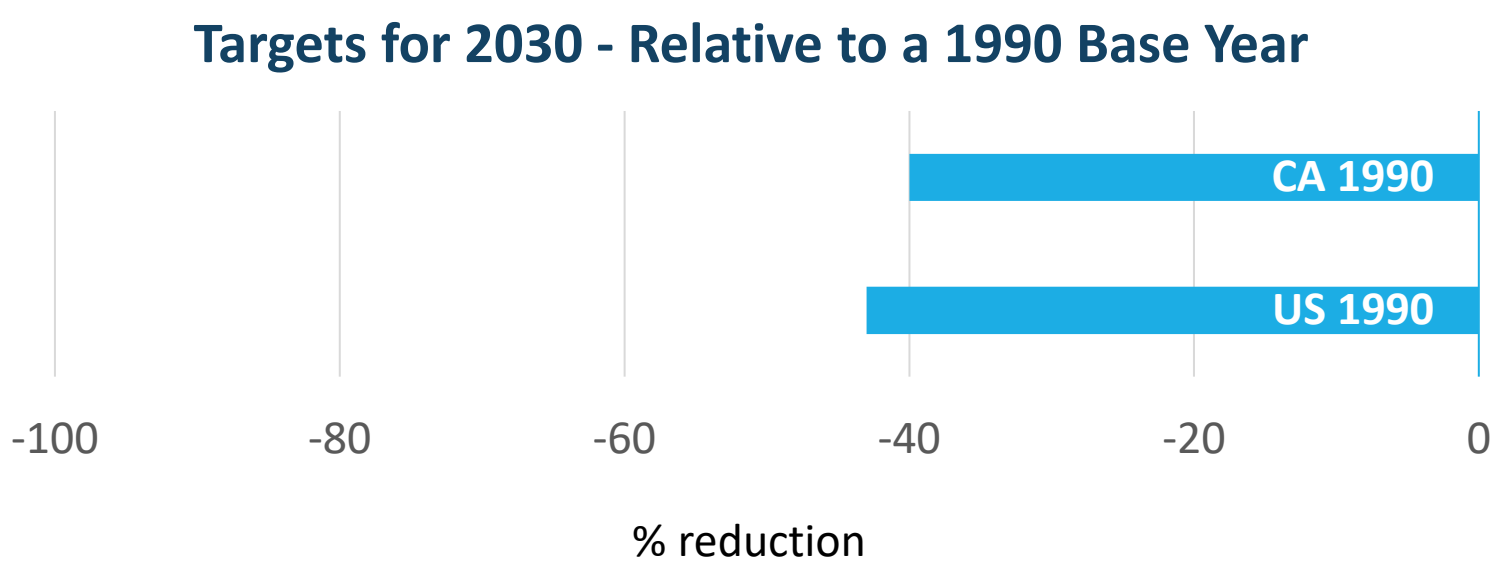
Data Source: CALFIRE, 2021

California Droughts

- More extreme droughts by the end of the 21st century
  - Decrease in precipitation frequency from fewer non-atmospheric river storms
  - Long-term declines in groundwater reserves that cannot be recovered during subsequent wet periods
- Human-induced global warming contributed to the recent snow droughts experienced in the Sierras

July 2021, Newman: Deeping drought threatens its $6 billion almond industry. *Source: Terence Chea/AP*

Comparable 2030 State and Federal Climate Targets

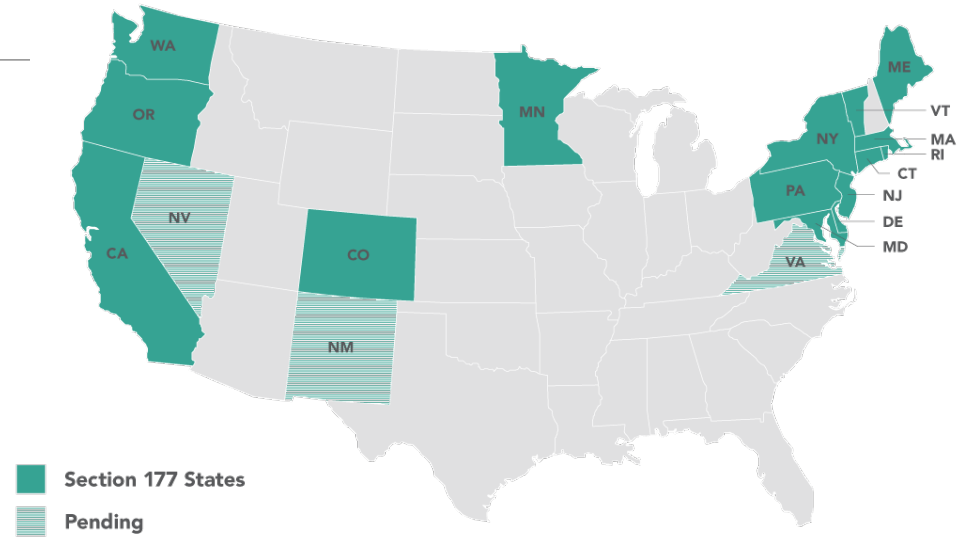


- California 2030 Target: 40% below 1990 levels
- Federal 2030 Target: 50-52% below 2005 levels
- Success hinges on implementing programs

Federal Scope	CA Scope
Electricity Transportation Industry High GWP Gases	
No electricity imports Minus net land use sinks	Plus electricity imports (per AB 32) No land use sinks (tracked in separated NML inventory)

Collaboration Yields Bigger GHG Reductions: Light Duty Vehicles

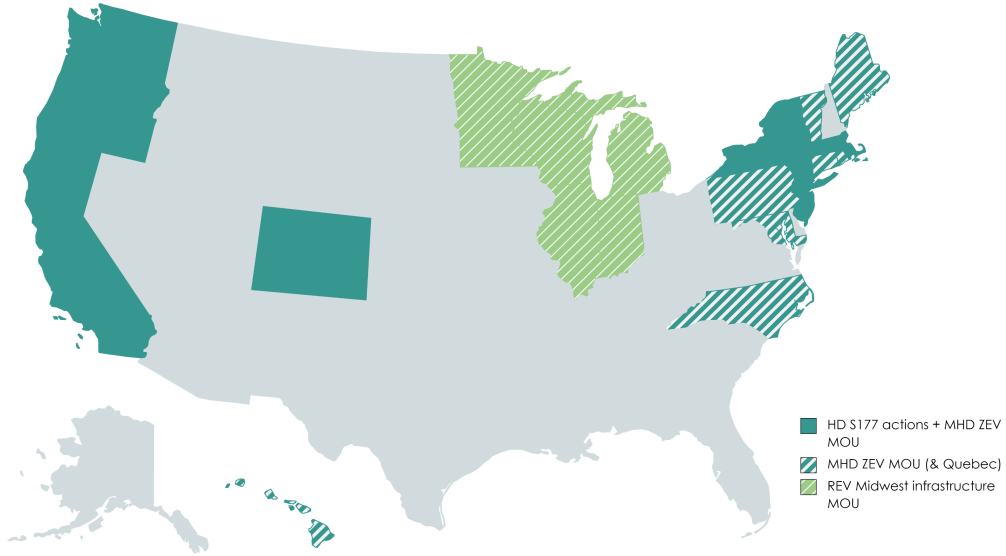
- 13 states have adopted CA's LEV GHG Regs
  - § 177 States (ca.gov) → 36% of US LDV sales
- This CA leadership drives more GHG reductions; Pushes U.S. EPA action
  - Obama Admin Fed rules followed CA
- New ZEV Reg proposal for 100% by 2035
  - Goal to retain existing state partners
  - Additional states considering adoption
  - Larger market pushes automaker technology

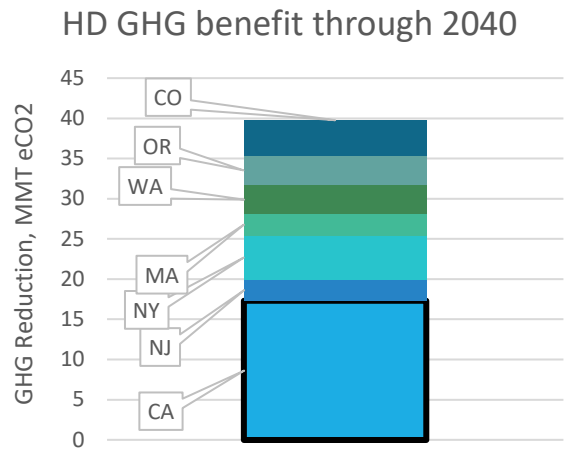


	2018 share of US market	ZEV US Sales with 100% Reg
CA Only	11.7%	1.8 M
CA + Existing 177 ZEV States	30%	4.5 M

Collaboration Yields Bigger GHG Reductions: Heavy Duty Vehicles

- 6 states (CO, MA, NJ, NY, OR, WA) publicly working to adopt CA's HD GHG Regs (Advanced Clean Trucks & Phase 2 GHG)
- Joint states' action more than doubles CA-alone GHG reductions; Critical to establishing U.S. EPA HD ZEV action
  - ZEVs requirements not yet contemplated in US EPA HD rules
- Additional Conversations: more states and new Advanced Clean Fleets reg development
  - Growing state partnerships
  - Larger market alignment driving costs and multi-party collaboration across vehicles, infrastructure, and financing
  - Providing market certainty regarding the end point to combustion sales





Building on California Leadership on SLCP

HFCs are the largest sector remaining in 2045

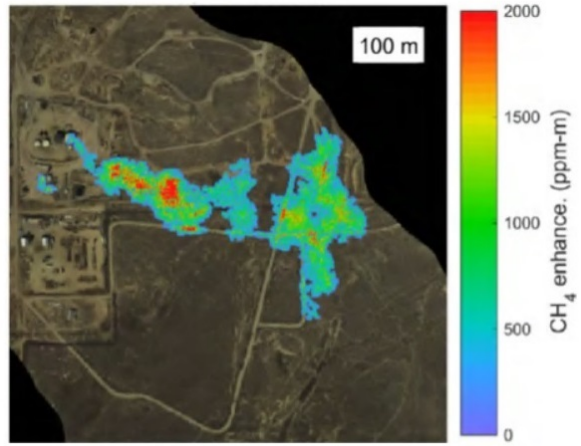
- 16 states have adopted California HFC Refrigerant Management Program
- Federal AIM Act – recently approved refrigerant related petitions with new national rules modeled on California's program

Methane Fugitive Emissions

- California strongest in nation on oil and gas methane regulations
- Carbon Mapper Satellites: private-public partnership would gather global data on large methane emissions

HFCs refrigerants

Methane gas leakage



Tank leaking methane in Kern oil field

Getting to Net Negative

- An estimated 23% of total anthropogenic GHG emissions (2007-2016) derive from agriculture, forestry and other land-use
- IPCC places CO_2 capture and storage in the context of climate change mitigation options
  - Biological and mechanical sinks
    - Improved and sustainable forest management
    - Increased soil organic carbon content
    - Carbon capture and use/storage
- Net negative must reflect global, national, regional action across all sectors

2022 Scoping Plan Update

Draft scenarios under development

- Achieve carbon neutrality in 2035 or 2045
- Drastically reduce or eliminate fossil combustion emissions
- Include and exclude carbon capture and sequestration and direct air capture
- In parallel, model how to reduce emissions and increase sequestration in the natural and working lands sector

Scoping Plan Development Process

- Public process to date: 9 joint agency/CARB workshops, 7 EJ Advisory Committee meetings
- Looking ahead
  - Continued to have public workshops including joint workshops with other agencies
  - Two standing monthly EJ Advisory Committee public meetings
  - Community engagement meetings
- Board Meetings
  - Joint Board and EJ Advisory Committee meetings
  - Informational update -early 2022
  - Draft Scoping Plan – June 2022
  - Final Scoping Plan – late 2022

Future Major Board Items that Support Clean Air & Climate Targets

- Funding Plan
- Commercial Harbor Craft
- Advanced Clean Fleet
- Advanced Clean Cars 2
- Small Off-road Engines
- In-use Locomotives
- Zero emissions appliances

Thank You